

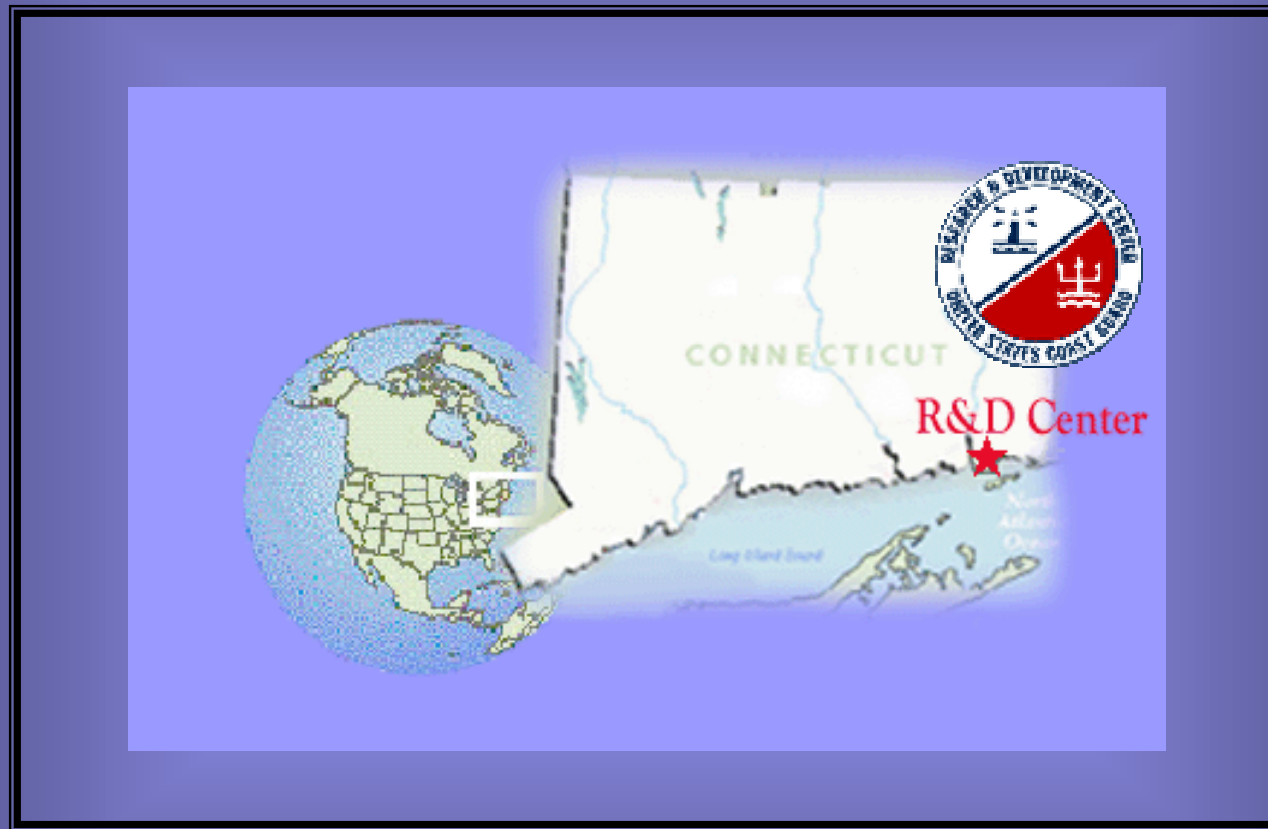


USCG Fuel Cell Demonstration Project Air Station Cape Cod

Presented to ENERGY 2004

**LCDR Chris Lund, P.E.
USCG R&D Center**

United States Coast Guard Research and Development Center



30 YEARS OF MARITIME
RESEARCH & DEVELOPMENT





Fuel Cell Demonstration Project



Overview

- Project Background
 - Budget & Schedule
 - System Specifications
 - Performance to Date
 - Project Challenges
 - Lessons Learned
 - Future Endeavors
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Project Goals



Primary Goal:

Meet CG 1997/1998 Energy Objectives:

- Reduce all CG facility energy costs 20% by 2005
 - Minimize the use of petroleum fuels...through investments in engineering
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Project Goals



Explore Benefits/Feasibility of Fuel Cells

- Grid Independence
- Environmentally Friendlier Power
- High Quality Power
- Reliable Emergency Power
- Cost Effectiveness



Budget



Utilized several grant options including:

- Various USCG programs (\$1.07M)
- DOE – Climate Change Program (\$250k)
- Massachusetts Technology Collaborative (\$406k)
- Keyspan Energy (\$100k)
- Total Contract Cost \$1.83 Million



Budget



Cost Breakdown:

- Fuel Cell \$1,250K
- Heat Recovery \$150K
- Engineering/Project Management \$143K
- Site Preparation \$100K
- Installation/Start-up \$66K
- Interconnect \$60K
- Modifications \$66K (Mod. Rate: 4%)



Schedule



Major Project Milestone	Baseline Date	Actual Date	Variance
Start Engineering & Design	04 Oct 2001	04 Oct 2001	None
Design Review Meeting	29 Nov 2001	29 Nov 2001	None
Final Design Complete	13 Dec 2001	18 Apr 2002	126 Days
Commence Site Preparation (slab, piping, etc.)	18 Mar 2002	29 Apr 2002	42 Days
Fuel Cell Fabricated, Tested, & Delivered	17 Apr 2002	14 Mar 2003	331 Days
Finish Site Preparation	19 Apr 2002	13 Jun 2002	55 Days
Complete Fuel Cell Installation	01 May 2002	14 Mar 2003	318 Days
Startup Fuel Cell	02 May 2002	27 Mar 2003	330 Days
Begin Acceptance Testing	02 May 2002	13 Apr 2003	347 Days
Fuel Cell Accepted & On Line	15 May 2002	16 May 2003	366 Days
Commence First Year of Operation	16 May 2002	17 May 2003	366 Days



System Specifications



Fuel Cell Energy, Inc. DFC 300 MCFC Fuel Cell

Net Power Output /Power at Plant Rating	250 kW/375 kVA
Voltage	480 VAC 50 or 60 Hz
Net Electrical Efficiency at Rated Output	47% LHV
Heat Rate	7,260 Btu/kWh LHV
Fuel Consumption at Rated Output	32 scfm @ 933 Btu/cf LHV
Water Uptake	45 gph
Water Discharge	23 gph
Available Heat (at rated power)	Approx. 300,000 Btu/hr





Performance to Date - Hours



June 1, 2003 – May 31, 2004

Total Hours: 8784

Generating Hours: 8449

Stand-by/Shut Down: 335

Operational Availability: 96.1%

Monthly Opavail High: 100%

Monthly Opavail Low: 81%



Performance to Date - Production



June 1, 2003 – May 31, 2004

Total Electrical Production: 1392 MWh

Total Electricity Delivered: 1250 MWh

Highest Monthly Production (May): 128 MWh

Lowest Monthly Production (April): 98.5 MWh

Total Possible Yearly Output: 2190 MWh

Capacity Factor: 0.64

Gas Consumption: 109,480 CCF



Project Challenges



Three Primary Challenges

- **Commercial Utility Interconnection**
 - **Manufacturing & Testing Delays**
 - **Lower than Anticipated Loads**
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Lessons Learned



Pre-Planning Stage

- **Seek out availability of fund sources**
 - **Conduct thorough & accurate feasibility studies**
 - **Plan/budget/contract for first five years of Operation & Maintenance**
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Lessons Learned



Feasibility Activities

- Studies should be as long term as possible
 - Existing infrastructure vs. New Location
 - Inspect adjoining/connecting infrastructure
 - Invest in the feasibility studies
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Lessons Learned



Project Team

- **Mandate Good Communications**
 - **Good partnerships are key**
 - **Keep the team intact**
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Lessons Learned



Project Design & Operations

- For R&D, expect schedules to slip
 - Have reasonable expectations
 - Change is difficult – Training is paramount
 - Ancillary equipment important
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Lessons Learned



Utility Concerns

- Fuel cells require several inputs -work with the utilities
 - Contact the electrical utility as early as possible
 - Make the utility a partner -try to demonstrate how they benefit
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Lessons Learned



Summary

- Extensive interaction with electrical utility is critical
- Complete & accurate data/studies is crucial to success
- Be flexible with new technology/suppliers
- Planning, teamwork, communication



Future Work



- Upgrade the Interconnection
 - Maximize Thermal Recovery & Utilization
 - Broker Renewable Energy Certificates
 - Install Automated Data Acquisition
 - Install an Energy Management System
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Questions???



**LCDR Chris Lund, P.E.
Chief, Assessment Branch
USCG R&D Center
1082 Shennecossett Rd.
Groton, CT 06340
Clund@rdc.uscg.mil**
